IEEE TRANSACTIONS ON

# MAGNETICS

A PUBLICATION OF THE IEEE MAGNETICS SOCIETY

JANUARY 2001 VOLUME 37 NUMBER 1 IEMGAQ (ISSN 0018-9464)

PART I OF TWO PARTS


**SELECTED PAPERS FROM THE 10TH ELECTROMAGNETIC LAUNCH TECHNOLOGY (EML) SYMPOSIUM**
**Renaissance Parc 55 Hotel, San Francisco, California, April 25–28, 2000**

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# 2000 Peter Mark Medal Presentation

The 2000 Peter Mark Medal for Outstanding Contribution to Electromagnetic Launch Technology was awarded to Dr. Gennady A. Shvetsov of the Lavrentyev Institute of Hydrodynamics, Russian Academy of Sciences. The award was presented by Dr. Harry D. Fair on behalf of the EML Permanent Committee at the 10th Symposium on Electromagnetic Launch Technology, held April 25-28, 2000, in San Francisco, California.

The Peter Mark Medal, initiated in 1983, is named in honor of the late Professor Peter Mark, solid state physicist and electrical engineer from Princeton University whose enthusiasm, intelligence, and vision helped contribute to the initiation of the U.S. program on electromagnetic launch technology. In addition to his participation in the development of the initial proposal to the Department of Defense, his early contributions as one of the founding members of the U.S. National Advisory Panel on Electromagnetic Guns and Launchers and his technical insight provided inspiration and direction for the emerging research program.

Dr. Harry Fair (L) presenting Peter Mark Medal to Dr. Gennady Shvetsov (R).

Dr. Gennady A. Shvetsov, current Head of the Laboratory of High Energy Density Physics and Vice Director of the Lavrentyev Institute of Hydrodynamics of the Siberian Division of the Russian Academy of Sciences, has been working on the problem of the high-velocity acceleration of solids for more than thirty years. Dr. Shvetsov has remained devoted to research and development activities and has established an international reputation as a technical expert in his field.

Dr. Shvetsov graduated from the Physical Department of Novosibirsk State University in 1967, having studied the acceleration of solids to high velocities and the problems of high-velocity impact under the guidance of Dr. V. M. Titov. In his culminating work at the University, Shvetsov focused on an explosive method of acceleration of macroparticles to high velocities, investigating the specific features of the high-velocity impact of macroparticles on rocks. Upon his graduation, Dr. Shvetsov was invited to work at the Institute of Hydrodynamics (currently known as the Lavrentyev Institute of Hydrodynamics) as a training researcher. His first paper, "Analysis of Capabilities of Rail Accelerators of Solid Bodies Powered by an Explosive Magnetocumulative Generator" (1979), established him as a leading scientist and contributor to this important field. Dr. Shvetsov is ranked among the pioneers of researchers working in the field of hypervelocity electromagnetic acceleration of solids.

In the area of electrical pulse power, Dr. Shvetsov has developed explosive magnetohydrodynamic (MHD) and magnetocumulative generators (MCG) as a power supply for electric guns, as well as a model of operation of an explosive generator for railguns. Dr. Shvetsov has conducted experiments on acceleration of solids in railguns fed by explosive MHD and MC generators in which velocities of 7.4 km/s were obtained for particles of mass of about 1.5 g, ranking among the highest velocities achieved for this method of acceleration. In railguns powered by capacitor banks, velocities of 6.0 km/s were reached for the same bodies for only a 0.5 m length of the accelerator.

In the area of investigation of physical processes that limit the attainment of high velocities in the channels of railgun accelerators of solids, Dr. Shvetsov measured for the first time the structure and dynamics of plasma armatures in the interior of the railgun and the brightness temperature of the plasma armature. He also demonstrated the following: Under certain conditions typical of acceleration of solids, the plasma armature lags behind the accelerated body, which moves simply by inertia after that; the main limitations in attainment of high velocities are related to electrode erosion; and the transition to composite materials can significantly increase the critical current density and decrease erosion of electrodes.

In the area of new technologies and materials, Dr. Shvetsov has developed new technologies for obtaining erosion-resistant materials (explosive welding, explosive compacting of powders). His experiments have shown that the use of composite materials can considerably increase the critical current density; more specifically, experiments on erosion of Mo/Cu and W/Cu electrodes produced by the explosive compaction of powders have revealed that, under certain conditions, erosion of these materials can be less than the erosion of pure Mo and W electrodes by three times (and this is not the limit). The technologies developed by Dr. Shvetsov